

Coronavirus Disease 2019 (COVID-19)

Information for Pediatric Healthcare Providers

Who this is for: Pediatric Healthcare Providers

What this is for: To inform pediatric healthcare providers of information available on children with COVID-19.

How to use: Refer to this information when managing pediatric patients with confirmed or suspected COVID-19.

Burden of COVID-19 and epidemiologic risk factors in children

Relatively few cases of COVID-19 caused by SARS-CoV-2 infection have been reported in children compared with the number of cases in the general population. As of Feb. 20, 2020, 2.4% of the 75,465 cases (confirmed and suspected) in China had occurred among persons younger than 19 years old. An analysis from one large city in southern China suggests that, among all cases, the proportion of children younger than 15 years old may have increased from 2% to 10% from early to later in the outbreak.

Of the cases reported in China to date, most children had exposure to household members with confirmed COVID-19. In one case, a three-month-old child visited a healthcare setting before COVID-19 was confirmed and was thought to be the first case in a family cluster—the source of infection (healthcare or community) was not determined. At least one child who primarily had gastrointestinal symptoms sought care at multiple outpatient healthcare centers before becoming a confirmed case.

During previous outbreaks caused by related zoonotic beta coronaviruses, Severe Acute Respiratory Syndrome (SARS) and Middle Eastern Respiratory Syndrome (MERS), the majority of confirmed cases occurred among adults. During the 2002-2003 SARS epidemic, less than 5% of cases were diagnosed in patients younger than 18. The majority of SARS cases in patients younger than 18 were thought to have occurred through household transmission, though some cases were hospital-acquired. The majority of MERS-CoV cases in children were also thought to be due to household transmission.

Children may play a role in the spread of SARS-CoV-2 in the community. In one report examining 10 infected children in China, SARS-CoV-2 ribonucleic acid (RNA) was detected in respiratory specimens up to 22 days after symptoms began and in stool up to 30 days after symptoms began. A case report of a 6-month-old infant describes detection of SARS-CoV-2 RNA in blood, stool, and multiple nasopharyngeal swab samples, even though the infant's only documented manifestation of illness was one recorded temperature of 38.5° C (101.3° F). Viral culture was not performed on specimens in these reports; therefore, it is uncertain whether persistent or asymptomatic RNA detection represented a potentially transmissible virus.

Currently, it is unknown if differences in reported incidence of confirmed COVID-19 among children versus adults in China is because of difference in exposures (e.g., children are less likely to care for sick contacts), disease severity, testing, or surveillance (e.g., symptoms at presentation differ from case definitions for surveillance or diagnosis).

Clinical presentation in children

Symptoms in Pediatric Patients

Illness among pediatric cases appear to be mild, with most cases presenting with:

- symptoms of respiratory infection
- cough
- nasal congestion
- rhinorrhea
- sore throat

The predominant signs and symptoms of COVID-19 reported to date among all patients are similar to other viral respiratory infections. These include fever, cough, and difficulty breathing. Gastrointestinal symptoms, including abdominal pain, diarrhea, nausea, and vomiting, were reported in a minority of adult patients.

In a report of nine hospitalized infants in China with confirmed COVID-19, only half presented with fever. At least one child to date had primarily gastrointestinal symptoms of vomiting, diarrhea, and anorexia at initial presentation. There have been multiple reports to date of children with asymptomatic SARS-CoV-2 infection.

Data from pediatric cases of SARS and MERS also show milder symptoms among children compared with adults, and adolescents with SARS had more severe symptoms compared with younger children. Co-detection of other respiratory pathogens (influenza, respiratory syncytial virus, *Mycoplasma pneumoniae*) have been described in children with COVID-19.

Signs and symptoms of COVID-19 in children may be similar to those for common viral respiratory infections or other childhood illnesses. It is important for pediatric providers to have an appropriate suspicion of COVID-19, but also to continue to consider and test for other diagnoses, such as influenza (see [CDC's Flu Information for Healthcare Professionals](#) for more information).

Clinical course and complications in children

Complications of COVID-19 appear to be milder among children compared with adults based on limited reports from China. Severe complications (e.g., acute respiratory distress syndrome, septic shock) were reported in one case of a 1-month-old with confirmed COVID-19. Other reports describe a mild disease course, including in infants. As of February 2020, just one of the 2,114 deaths among 55,924 confirmed COVID-19 cases in China occurred among children younger than 20 years old. No further details were provided about this patient.

Chest X-rays of children with COVID-19 show patchy infiltrates consistent with viral pneumonia, and chest CT scans have shown nodular ground glass opacities.

During the 2003-2004 SARS outbreak, patients younger than 12 years old had milder and shorter illnesses than adults and no deaths were reported. Death was rare among children with MERS. One pediatric death from MERS was reported in a child with cystic fibrosis who had respiratory specimens also positive for influenza A(H1N1)pdm09 and multidrug resistant *Pseudomonas*.

Though symptoms and disease course for COVID-19 may be milder in children than adults, it is unknown if children with underlying medical conditions are at increased risk of severe disease.

Treatment and prevention

Currently, there are no antiviral drugs recommended or licensed by the U.S. Food and Drug Administration (FDA) for COVID-19. Clinical management includes promptly using recommended infection prevention and control measures (e.g., a respirator or facemask, gloves, gown, eye protection) in healthcare settings and supportive management of complications.

Lopinavir/ritonavir and interferon-alpha have been used for treatment of children with COVID-19 in China but safety and efficacy of these drugs have not been determined. Remdesivir is an investigational antiviral drug that has been reported to have in-vitro activity against SARS-CoV-2. Some adult patients with COVID-19 have received intravenous remdesivir through clinical trials or compassionate use, although remdesivir has not been used for treatment of children with COVID-19. For additional information on investigational therapeutics, please see [Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease \(COVID-19\)](#).

Additional information

For general information on caring for patients with confirmed or possible COVID-19 please see: [What Healthcare Personnel Should Know about Caring for Patients with Confirmed or Possible COVID-19 Infection](#)

For CDC's latest clinical guidance for management of patients with COVID-19 please see: [Interim Clinical Guidance for Management of Patients with Confirmed Coronavirus Disease 2019 \(COVID-19\)](#)

For information on infection prevention and control recommendations, please see: [Interim Infection Prevention and Control Recommendations for Patients with Confirmed Coronavirus Disease 2019 \(COVID-19\) or Persons Under Investigation for COVID-19 in Healthcare Settings](#)

For information on COVID-19 and pregnancy, please see: [Frequently Asked Questions and Answers: Coronavirus Disease 2019 \(COVID-19\) and Pregnancy](#)

For information on COVID-19 and breastfeeding, please see: [Interim Guidance on Breastfeeding for a Mother Confirmed or Under Investigation For COVID-19](#)

For information for healthcare facilities on how to prepare for the COVID-19 outbreak: [Steps Healthcare Facilities Can Take Now to Prepare for Coronavirus Disease 2019 \(COVID-19\)](#)

References

1. Al-Tawfiq, J.A., R.F. Kattan, and Z.A. Memish, *Middle East respiratory syndrome coronavirus disease is rare in children: An update from Saudi Arabia*. World J Clin Pediatr, 2016. 5(4): p. 391-396.
2. Bartenfeld, M., et al., *Middle East Respiratory Syndrome Coronavirus and Children*. Clin Pediatr (Phila), 2017. 56(2): p. 187-189.
3. Cai, J., et al., *A Case Series of children with 2019 novel coronavirus infection: clinical and epidemiological features*. Clin Infect Dis, 2020.
4. Centers for Disease Control and Prevention. *Coronavirus*. 2020; Available from: <https://www.cdc.gov/coronavirus/index.html>; accessed 6 Mar 2020.
5. Chan, J.F., et al., *A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster*. Lancet, 2020. 395(10223): p. 255-258.
6. Chen, F., et al., *[First case of severe childhood novel coronavirus pneumonia in China]*. Zhonghua Erke Zazhi, 2020. 58(0): p. E005.
7. China Center for Disease Control and Prevention. *The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China*. Zhonghua Liu Xing Bing Xue Za Zhi, 2020. 41(2): p. 145-151.
8. Dowell, S.F. and M.S. Ho, *Seasonality of infectious diseases and severe acute respiratory syndrome-what we do know can hurt us*. Lancet Infect Dis, 2004. 4(11): p. 704-8.
9. Feng, K., et al., *[Analysis of CT features of 15 Children with 2019 novel coronavirus infection]*. Zhonghua Er Ke Za Zhi, 2020. 58(0): p. E007.
10. Hon, K.L., et al., *Clinical presentations and outcome of severe acute respiratory syndrome in children*. Lancet, 2003. 361(9370): p. 1701-3.
11. Liu, J., et al., *Community Transmission of Severe Acute Respiratory Syndrome Coronavirus 2, Shenzhen, China, 2020*. Emerging Infectious Diseases, 2020. 26(6). <https://doi.org/10.3201/eid2606.200239> 
12. Memish, Z.A., et al., *Middle East respiratory syndrome coronavirus disease in children*. Pediatr Infect Dis J, 2014. 33(9): p. 904-6.
13. Monto, A.S., J.S. Koopman, and I.M. Longini, Jr., *Tecumseh study of illness. XIII. Influenza infection and disease, 1981*. Am J Epidemiol, 1985. 121(6): p. 811-22.
14. Pan, X., et al., *Asymptomatic cases in a family cluster with SARS-CoV-2 infection*. Lancet Infect Dis, 2020.
15. Shen, K., et al., *Diagnosis, treatment, and prevention of 2019 novel coronavirus infection in children: experts' consensus statement*. World J Pediatr, 2020.
16. Stockman, L.J., et al., *Severe acute respiratory syndrome in children*. Pediatr Infect Dis J, 2007. 26(1): p. 68-74.
17. Wang, D., et al., *Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus-Infected Pneumonia in Wuhan, China*. JAMA, 2020.
18. Wang M, Cao R, Zhang L, Yang X, Liu J, Xu M, Shi Z, Hu Z, Zhong W, Xiao G. Remdesivir and chloroquine effectively inhibit the recently emerged novel coronavirus (2019-nCoV) in vitro. *Cell Res*. 2020 Feb 4. doi: 10.1038/s41422-020-0282-0. [Epub ahead of print]
19. Wei, M., et al., *Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China*. Jama, 2020.
20. Worby, C.J., et al., *On the relative role of different age groups in influenza epidemics*. Epidemics, 2015. 13: p. 10-15.
21. World Health Organization – People's Republic of China Joint Mission. *Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)*. Available at: <https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf>   ; accessed 6 Mar 2020.
22. Xia W., et al., *Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults*. Pediatric Pulmonology. 2020;1-6. <https://doi.org/10.1002/ppul.24718>  .

23. Zhang, Y.H., et al., *[2019-novel coronavirus infection in a three-month-old baby]*. Zhonghua Er Ke Za Zhi, 2020. 56(3): p. E006.